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User Experience Design Development of the Siakad UNY Mobile Application Using the Design Thinking Method

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Abstract

This study aims to develop and evaluate the mobile-based Academic Information System application of Yogyakarta State University to enhance the quality of student user experience in accessing academic services. The application was developed to provide academic service solutions that better align with user needs, particularly for smartphone usage. This research employed a Research and Development method using a Design Thinking approach, encompassing the stages of empathize, define, ideate, prototype, and test. The study was conducted at Yogyakarta State University involving 35 active students from various study programs as end users. Data were collected using the User Experience Questionnaire (UEQ) distributed online via Google Forms. The UEQ instrument demonstrated good reliability, with all dimensions achieving Cronbach's Alpha values above 0.7. Data analysis was performed using the UEQ Data Analysis Tool to obtain mean scores and user experience quality categories based on the UEQ Benchmark. The results indicate that the Siakad UNY mobile application achieved an Excellent rating in attractiveness, efficiency, stimulation, and novelty, and a Good rating in perspicuity and dependability. These findings suggest that the application provides a high-quality user experience and is suitable as a mobile-based academic service solution. Further development is recommended to enhance clarity and system reliability to optimize user experience quality.

Keyword: Image Processing, Mobile Devices, Algorithm.

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INTRODUCTION

The development of digital technology has encouraged the use of mobile devices in higher education services, including the Academic Information System (SIAKAD), which serves as a centralized management system for student academic data (Ilham et al., 2021). The use of mobile applications is considered capable of improving access, service efficiency, and user convenience compared to conventional web-based systems (Putra & Tedyyana, 2021). Yogyakarta State University (UNY) has provided a web-based Siakad, but it is not yet fully optimized when accessed via mobile devices, particularly in terms of responsiveness and ease of use.

Several problems have been identified in Siakad UNY, such as an unappealing interface, complex navigation, and a display that does not adapt to mobile device screen sizes. This condition impacts the poor user experience, particularly for students, in accessing important features such as attendance and academic information. Furthermore, the quality of the system's usability and user experience has never been systematically evaluated using standardized instruments, so potential design issues have not been fully identified (Yohanes & Nurkhamid, 2023).

Previous research has shown that evaluating and developing the user experience in mobile-based academic systems can increase effectiveness, satisfaction, and user acceptance (Wenerda et al., 2023). One widely used user experience evaluation method is the User Experience Questionnaire (UEQ), which measures user perceptions across six main dimensions: attractiveness, perception, efficiency, dependability, stimulation, and novelty (Yaasiin et al., 2022). The UEQ is considered capable of providing a comprehensive overview of the pragmatic and hedonic aspects of user experience in academic mobile applications (Pancha et al., 2024).

This research contributes to filling the research gap related to the limited number of studies on the development and evaluation of user experience in academic information systems in higher education in Indonesia that focus on mobile platforms (Setiawan, 2024). Academically, this research enriches the study of Human–Computer Interaction (HCI), while practically, the research results are expected to form the basis for recommendations for developing Siakad UNY to be more user-friendly, efficient, and oriented towards student needs (Hidayati & Cahyadi, 2021).

In this study, the Design Thinking method was chosen because it is one of the approaches used to design UI/UX that focuses on user needs. This process involves five stages: empathy, definition, ideation, prototyping, and testing. Through this method, the authors were able to more quickly understand user needs through experimentation, visualization, and application

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development. Design Thinking is often used because it helps generate effective solutions, especially for mobile-based applications aimed at improving the user experience.

METHOD

The Design Thinking method is used in the development of the Siakad UNY mobile-based application to address problems faced by users. The purpose of implementing this method is to systematically explore user needs and constraints as a basis for formulating appropriate design solutions. After the solution idea is obtained, the next stage is to implement the design results into a mobile application prototype (Svalina et al., 2022). Design Thinking is iterative so that it allows for improvements and refinements to be made to the design at each design stage if obstacles or inconsistencies with user needs are found (Putri et al., 2024). This method consists of five main stages, namely empathize, define, ideate, prototype, and testing, which are used to obtain user data and feedback in a more structured manner.

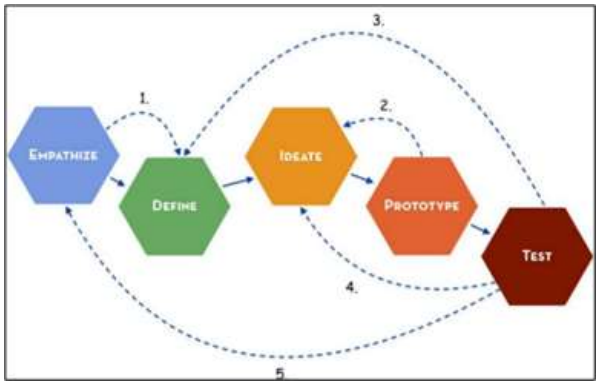


Figure 1. Design Thinking Process

Empathize

The Empathize stage aims to understand the experiences and needs of Siakad UNY users. Initial data collection was conducted through website usage observations and usability measurements using the System Usability Scale (SUS) as the basis for problem formulation and mobile application design development.

Define

The Define stage aims to formulate core problems based on the findings from the Empathize stage. Data from observations and usability measurements using the SUS are analyzed to produce a focused problem statement as the basis for developing the user experience design for the Siakad UNY mobile application.

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Ideate

The Ideate stage focuses on developing design solutions based on the problems formulated in the Define stage. During this stage, various ideas for improving the interface, navigation flow, and features of the Siakad UNY mobile application are developed, taking into account the principles of usability and user experience.

Prototype

The Prototype phase aims to translate design ideas into concrete and functional forms. During this phase, a high-fidelity prototype of the Siakad UNY mobile application was developed using Figma and initially implemented using React Native as evaluation material during the testing phase.

Testing

The testing phase was conducted to evaluate the application's quality and feasibility through expert validation and user testing. The testing involved 35 students using the User Experience Questionnaire (UEQ) to assess six aspects of user experience as a basis for assessing the effectiveness of the developed solution.

RESULTS AND DISCUSSION

The aim of this research is to develop interface and user experience (UI/UX) design solutions for the mobile-based Siakad UNY application. The development process was conducted using a Design Thinking approach consisting of five stages.

Empathize

The Empathize stage validated the System Usability Scale (SUS) instrument by two experts to ensure the suitability of the statement items with the evaluation context of the Siakad UNY website, then continued with initial data collection from active UNY students using the SUS questionnaire distributed through Google Forms. The data obtained provided a quantitative overview of the level of usability and revealed various user problems, such as navigation difficulties, less than optimal interface displays on mobile devices, and cognitive load when accessing academic information. These findings became the basis for problem formulation and determining improvement priorities in the next development stage, with a summary of user problems presented in the table below.

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Table 1. User Problems with the Siakad UNY Website

No.	Problem Indicators	User Issues
1	Unresponsive display on mobile	The website does not run optimally on smartphone devices, some elements are messy or too small.
2	The login process is less practical	Users experience login sessions that sometimes fail and have to re-login when changing pages.
3	Page load time feels long	Some pages, especially academic data, take longer to display.
4	Menu terms and labels are unclear	Some menu labels are considered less informative for new users.
5	Information layout is less structured	Information on pages such as schedules, KRS, or grades looks dense and lacks visual hierarchy.
6	Lack of clarity in the flow of academic tasks	Users are confused about the order of filling in, verification, or KRS/Value status.
7	Visual accessibility limitations	Text contrast, font size, and element arrangement do not support comfortable reading in long sessions.
8	Page responsiveness	Students experience difficulties in taking attendance because the design is not responsive.

The test was conducted by distributing a System Usability Scale (SUS) questionnaire consisting of 10 statements with a 5-point Likert scale to 35 students at Yogyakarta State University. The SUS scores obtained were then calculated and averaged, resulting in a final score of 71.0, which based on SUS interpretation is at grade C with an OK category. These results indicate that the UNY Siakad website has met the usability aspects according to the ISO 9241-11 standard, including effectiveness, efficiency, and user satisfaction, so it is considered suitable for use even though there is still opportunity for further development to improve the quality of the user experience.

Define

The Define stage was conducted to formulate the core user problems based on the findings in the Empathize stage obtained through the initial questionnaire, usage observations, and analysis of student difficulty patterns in accessing the Siakad UNY website. The analysis results indicated the need for improvements in navigation, information structure, system

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responsiveness, and ease of access to academic features such as attendance and class schedules. These findings were then synthesized into a more focused problem and formulated in the form of how might we questions as the basis for determining solutions and developing ideas in the next stage. The results of how might we can be seen in the following figure.



Figure 2. How Might We

Ideate

The Ideate stage is the idea development phase that aims to generate various alternative solutions based on the problems formulated in the Define stage. In this study, the ideation process was carried out by integrating user findings, the How Might We formulation, and the functional requirements of the academic system to design the initial concept of the Siakad UNY mobile application. Ideas and solutions were systematically arranged in a table form as a basis for mapping feature development, followed by the preparation of a Site Map to map the information structure. This stage serves as a conceptual foundation that ensures the direction of application development is aligned with user needs and identified problems.

Table 2. Ideas and Solutions

No	Ide dan Solusi
1	The interface redesign was carried out by applying mobile-first principles and responsive layout so that the Siakad UNY display is proportional on various smartphone screen sizes.
2	The presence feature is designed to be simpler, faster, and more responsive by reducing interaction steps and optimizing components for ease of use on all mobile devices.
3	The authentication process is improved by optimizing the management of login sessions based on NIM and password so that users do not have to log in again when

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	changing pages.
4	Page load times are accelerated through data compression, API optimization, and the implementation of lazy loading to make academic information more accessible.
5	Menu labels have been revised to be more descriptive and equipped with supporting icons to make it easier for new users to understand the function of each menu.
6	Academic information is reorganized using a more structured visual hierarchy through the addition of borders, spacing, and a card system to improve readability.
7	Readability is improved through the use of larger font sizes, adequate color contrast, and more comfortable line height and padding settings for long-term interaction.
8	Academic processes such as filling out or monitoring status are designed using short guides so that users understand the flow more clearly.

To provide a more comprehensive understanding of the structure of the Siakad UNY application and the relationships between pages or features within it, the results of the formulation of ideas and solutions are then poured into a Site Map which is presented as follows.

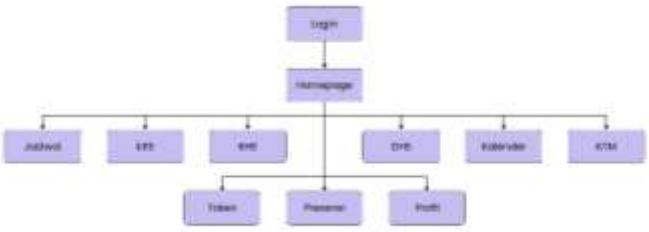


Figure 3. Site Map

Prototype

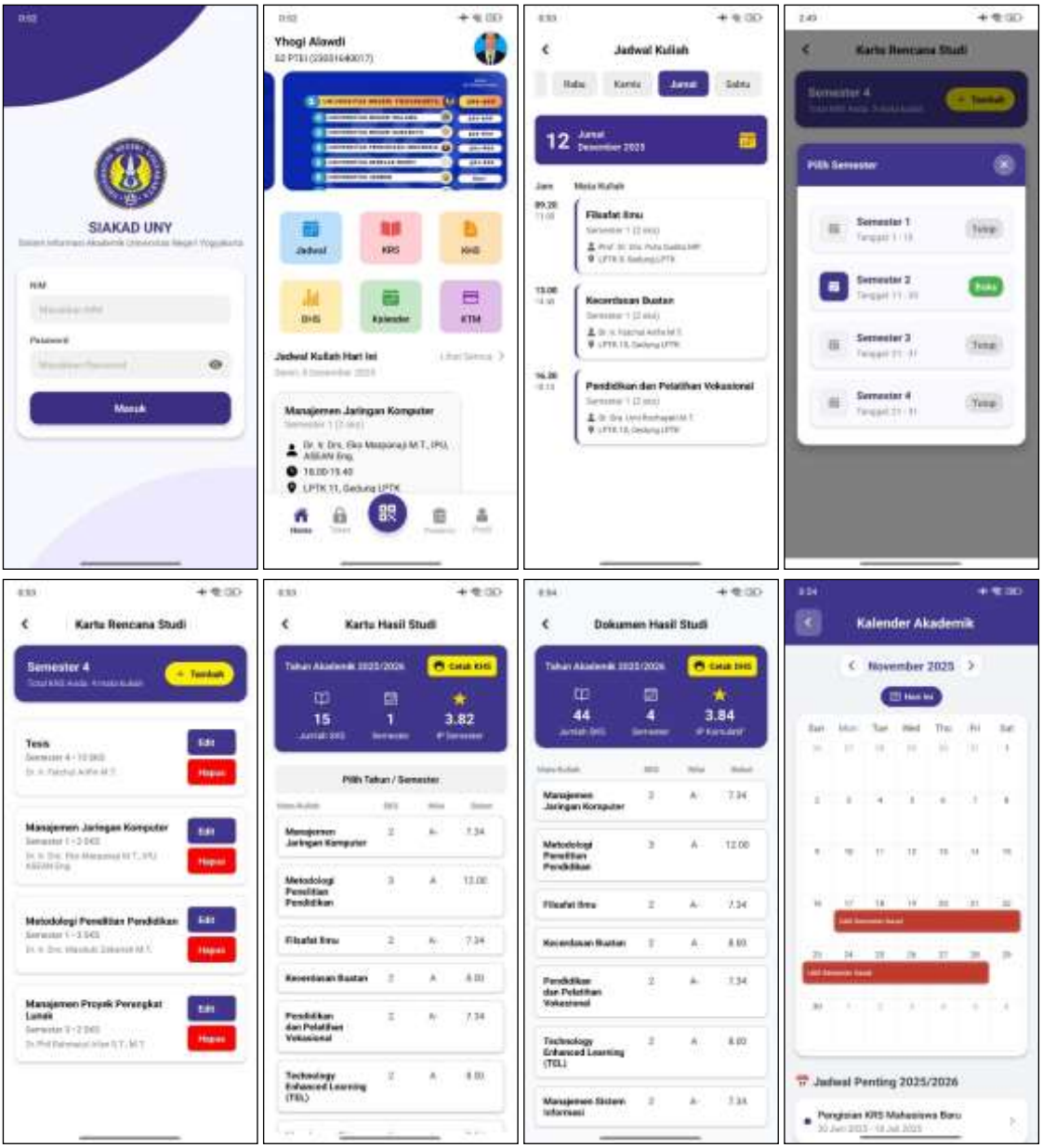
The Prototype stage is the process of transforming conceptual designs from the Ideate stage into functional artifacts that can be executed and evaluated. At this stage, high-fidelity designs from Figma are implemented into the React Native-based Siakad UNY mobile application, including the development of interface components, navigation flows, and core features such as login, KRS, grades, and schedules. The resulting prototype is used as a medium for design validation through evaluation by experts and users, as well as serving as a link between conceptual design and the testing stage to ensure the quality of usability and user experience before further evaluation.

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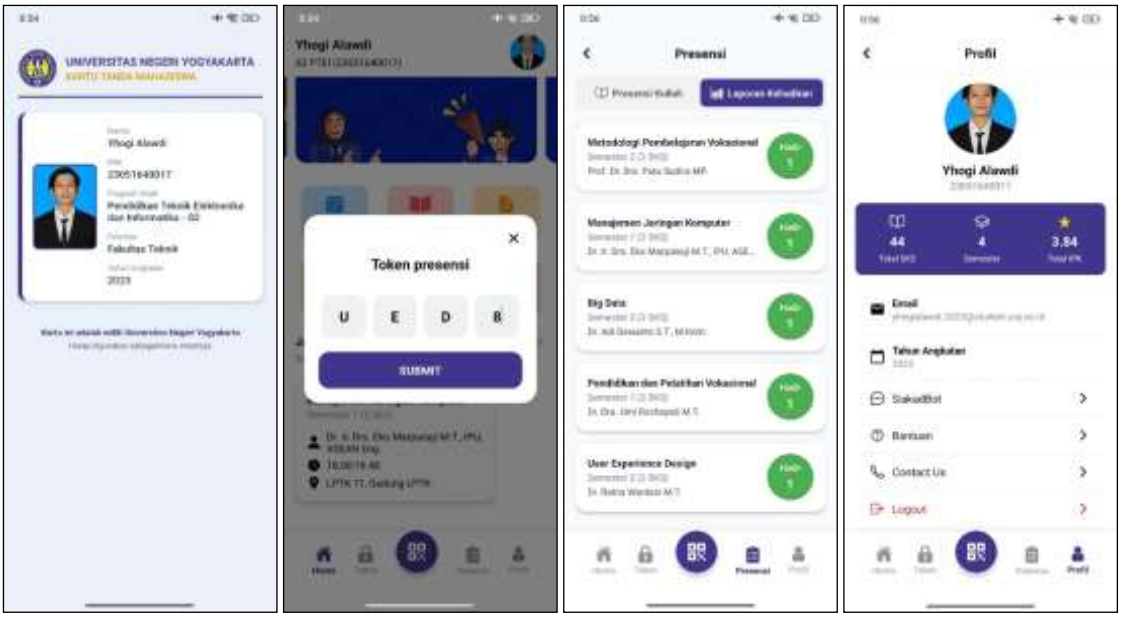


Figure 4. User Interface

Testing

The test uses the User Experience Questionnaire (UEQ) consisting of 26 statement items whose results are analyzed using the UEQ Data Analysis Tool version 13. After the UEQ score transformation process is complete, the next stage is to group the scores into 6 UEQ aspects, namely Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty. The grouping results are then visualized in the form of a benchmark diagram, as shown in the image below.

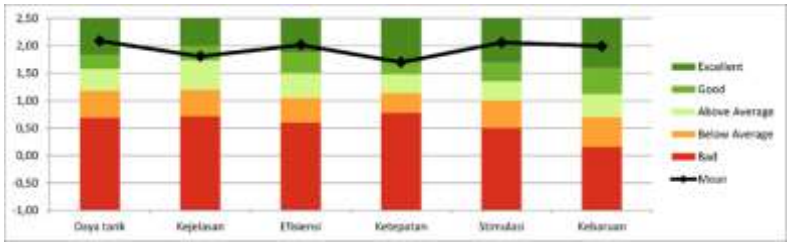


Figure 5. UEQ Benchmark

The diagram above shows the average score for each aspect of the UEQ, compared to the standard assessment categories: Excellent, Good, Above Average, Below Average, Bad, and Mean. According to the benchmark diagram, the Siakad UNY application received an excellent category for four aspects: Attractiveness, Efficiency, Stimulation, and Novelty. Meanwhile, the

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Perspicuity and Dependability aspects received a good category. The following table presents the results of the test on the score grouping that has been carried out.

Table 3. Interpretation of UEQ Questionnaire Results Data

Scale	Mean	Benchmark	Interpretation
Attractiveness	2,09	Excellent	In the range of the 10% best results.
Perspicuity	1,81	Good	10% of the results in the benchmark data set are better and 75% of the results are worse.
Efficiency	2,01	Excellent	In the range of the 10% best results.
Dependability	1,70	Good	10% of the results in the benchmark data set are better and 75% of the results are worse.
Stimulation	2,06	Excellent	In the range of the 10% best results.
Novelty	1,99	Excellent	In the range of the 10% best results.

The next step after UEQ score grouping and benchmark analysis was to evaluate the instrument's reliability to ensure the internal consistency of the data obtained. Reliability testing was conducted using the UEQ Data Analysis Tool version 13 by calculating the Cronbach's Alpha value for each UEQ aspect.

Table 4. Cronbach Alpha Score

Skala	Skor Cronbach Alpha
Attractiveness (Daya Tarik)	0,89
Perspicuity (Kejelasan)	0,91
Efficiency (Efisiensi)	0,88
Dependability (Ketepatan)	0,92
Stimulation (Stimulasi)	0,88
Novelty (Kebaruan)	0,86

The calculation results show that all aspects have a Cronbach's Alpha value above 0.7, indicating a high level of reliability. This finding indicates that each statement item within each aspect has a strong correlation and is able to represent the user experience consistently and reliably. Therefore, the data from the UEQ questionnaire is deemed suitable for use as a basis for evaluating the user experience of the Siakad UNY application being developed.

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CONCLUSION

Conclusion Based on the results of the research and development that has been done, an Android-based Siakad UNY mobile application was produced which was developed using the React Native framework with a Design Thinking approach that is oriented towards user needs, starting from the initial measurement of website usability using the System Usability Scale (SUS) to the evaluation of the application's user experience using the User Experience Questionnaire (UEQ). The SUS measurement results showed a score of 71.0 with the Ok category, which indicates that the Siakad UNY website has met the basic aspects of usability but still requires further development to improve the quality of the user experience. UEQ testing of the mobile application showed very good results, with the Excellent category in the Attractiveness, Efficiency, Stimulation, and Novelty aspects, and the Good category in the Perspicuity and Dependability aspects, which indicates that the overall quality of the application's user experience is at a good to very good level. In addition, the results of the reliability test using Cronbach's Alpha produced a value above 0.7 in all UEQ dimensions, so that the instrument is declared reliable and consistent in measuring the user experience of the Siakad UNY mobile application.

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